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First Named Inventor	Carmen Flosbach
Group Art Unit	1796
Examiner Name	Rabon A. Sergent

Total Number of Pages in This Submission

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Attorney Docket Number

FA1224 US NA

### ENCLOSURES (check all that apply)

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Printed Name	Rakesh H. Mehta
Date	February 19, 2008
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Application No.: 10/782,098

Filing Date: February 19, 2004

First Named Inventor: Carmen Flosbach

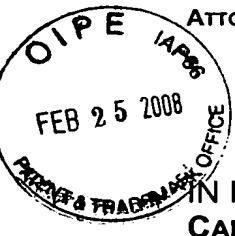
Title: Process for the Production of Polyurethane Di(Meth)Acrylates

Attorney Docket: FA1224 US NA

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APPLICATION No.: 10/782,098  
ATTORNEY DOCKET No.: FA 1224 US NA

PATENT  
GROUP ART UNIT 1796

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

IN RE APPLICATION OF:  
**CARMEN FLOSBACH, ET AL.**

APPLICATION NO.:  
**10/782,098**

FILED:  
**FEBRUARY 19, 2004**

FOR:  
**PROCESS FOR PRODUCTION OF  
POLYURETHANE DI(METH)ACRYLATES**

GROUP ART UNIT:  
**1796**

EXAMINER:  
**RABON A. SERGENT**

ATTORNEY DOCKET NO.:  
**FA1224 US NA**

**AMENDED APPEAL BRIEF IN RESPONSE TO NOTICE OF NON-COMPLIANT  
APPEAL BRIEF UNDER 37 C.F.R. § 41.37 & § 1.191**

MAIL STOP APPEAL BRIEF—PATENTS  
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Sir:

In response to the Notice of Non-Compliant Appeal Brief dated January 28, 2008 under 37 C.F.R. § 41.37(c)(i)(vii), and pursuant to 37 C.F.R. §§ 41.37(d), 41.37(c), 41.37(c)(1)(v) and generally to § 41.37, Appellants hereby file an Amended Appeal Brief in support of the Notice of Appeal filed October 24, 2007, appealing the Final Office Action dated July 18, 2007, and the Advisory Action dated October 15, 2007.

Appellants have corrected a typographical error in the argument section heading, to accurately reflect the claim numbers. Particularly, Appellants have changed the inaccurate claim number "9," to the correct claim number "10."

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**I. REAL PARTY IN INTEREST**

The real party in interest is the Assignee of the case, E. I. DuPont de Nemours & Company, a Delaware corporation (*hereinafter*, "DuPont").

**II. RELATED APPEALS AND INTERFERENCES**

None known to Appellants.

**III. STATUS OF THE CLAIMS**

Appellants canceled Claims 2-3, 5-6, and 8-9. Claims 1, 4, 7, and 10 remain in the case. The Examiner rejected Claims 1, 4, 7, and 10 under 35 U.S.C. § 103(a). This rejection is the subject of this appeal. The Examiner has not allowed any claims.

**IV. STATUS OF AMENDMENT**

There were no amendments after the final rejection, so there are no "pending" amendments.

**V. SUMMARY OF CLAIMED SUBJECT MATTER**

Generally, the present application describes a process for producing polyurethane di(meth)acrylates, the polyurethane di(meth)acrylate compositions, powder coating compositions comprising such polyurethane di(meth)acrylates and substrates coated with such powder coating compositions. In the claims under consideration, Claim 1 is the only independent claim.

**Claim 1**

Claim 1 relates to a process for the production of polyurethane di(meth)acrylates in which 1,6-hexane diisocyanate is reacted, without solvent and without subsequent purification operations, with a diol component, and with hydroxyethylacrylate or hydroxypropylacrylate, in the molar ratio  $x : (x-1) : 2$ , wherein  $x$  means any desired value from 2 to 5 (Page 2, Line 31, to Page 3, Line 2) and

wherein the diol component is selected from the group consisting of:

- (a) combinations of 20 to 80 mol% hydrogenated bisphenol A with 80 to 20 mol% 1,10-decanediol (Page 4, Lines 1-3),
- (b) combinations of 20 to 80 mol% hydrogenated bisphenol A with 80 to 20 mol% 1,6-hexanediol (Page 4, Lines 3-4),
- (c) combinations of 60 to 90 mol% neopentyl glycol with 40 to 10 mol% 1,6-hexanediol (Page 4, Lines 4-5),

and

- (d) three-component combinations comprising in each case 10 to 50 mol% 1,3-propanediol, 10 to 50 mol% 1,5-pentanediol and 10 to 50 mol% 1,6-hexanediol, wherein the mol percentages add up to 100 mol% in each of the combinations (Page 4, Lines 6-9).

## **VI. GROUND OF REJECTION TO BE REVIEWED ON APPEAL**

The rejection ground to be reviewed on appeal is the rejection of Claims 1, 4, 7, and 10 under 35 U.S.C. § 103(a), as obvious over WO 01/25359, equivalent to U.S. Patent No. 6,825,241 to Blum, et al. (*hereinafter, "Blum"*).

## **VII. ARGUMENT**

### **(A) REJECTION UNDER 35 U.S.C. § 103(A)-CLAIMS 1, 4, 7, & 10**

The Examiner rejected Claims 1, 4, 7, and 10 under 35 U.S.C. § 103(a) as being obvious over Blum. Appellants respectfully traverse and provide traversal arguments to the Examiner's Final Rejection and Advisory Action.

Specifically, according to the Examiner, Blum discloses polyurethane diacrylates and powder coatings derived from the polyurethane diacrylates, wherein the

polyurethane diacrylates are produced from the reaction of hexane diisocyanate with ethylene glycol, butanediol, and hydroxyethyl acrylate in a claimed molar ratio range.

The Examiner further argued that although other mixtures of diols that specifically meet those claimed are not exemplified in Blum, it does disclose the use of other diol species that meet those claimed. Because, according to the Examiner, the diols exemplified in Blum are included within the listing of diols of the present invention, this listing essentially establishes the equivalency of the other diol species disclosed to those of the example. Accordingly, the Examiner asserts that it would have been *prima facie* obvious to utilize any of the disclosed diols in the form of blends in the production of polyurethane diacrylates, in accordance with the teachings of the example.

Appellants respectfully disagree with the Examiner's conclusion of obviousness.

From the Examiner's own assertion, Appellants combination diols are not disclosed by Blum. The Examiner only strives to assert equivalency of the non-disclosed diols and diol combinations in Blum with those disclosed in the present invention, because some of the Blum disclosed diols are also listed together with the combination diols of the present invention.

Appellants submit that evidence of secondary considerations must be taken into account by the Examiner before concluding obviousness. Factors considered as evidence of secondary considerations include: commercial success, long-felt but unresolved need, failure of others, recognition of problem, failed attempts to solve problem, teaching away by those skilled, unexpected results and superior properties (surprising result), etc.

Appellants submitted additional evidence of unexpected results and superior properties demonstrated by the compositions of the present invention. Particularly, the present invention compositions show unexpected and superior result—powder coating compositions with simultaneously improved acid resistance and scratch resistance.

Appellants submitted the unexpected results/superior properties evidence in a 132 Declaration by the inventor Ms. Carmen Flosbach in Response to the December 19, 2005 Office Action. Appellants attach the 132 Declaration in the Appendix.

Appellants also summarize and discuss the substantive information in the 132 Declaration below.

Appellants determined (1) Acid Resistance and (2) Scratch Resistance of the powder coatings samples of Examples 1-8, & 11 of the present invention. In the experiment, Appellants sprayed powder coating compositions in a layer thickness of 80 µm onto steel sheets coated with commercially available electro-deposition paint, filler, and base coat (flashed off). The compositions were subsequently melted for 10 min at 140°C (oven temperature). The coatings were cured by ultra-violet radiation of a radiation intensity of 500 mW/cm<sup>2</sup> and a radiation dose of 800 mJ/cm<sup>2</sup>.

(i) How Acid Resistance Test was Conducted

50 µl of 36% sulfuric acid were dropped onto the paint films for 30 minutes at intervals of one minute at 65°C.

Assessment: Destruction of the film after X (0 to 30) minutes.

(ii) How Scratch Resistance Test was Conducted

Appellants determined Scratch Resistance in terms of residual gloss of the samples after wash scratching. Residual gloss was measured in percent, that is, ratio of initial gloss of the clear coat surface to its gloss after wash scratching; gloss measurement in each case was performed at an angle of illumination of 20°. Wash-scratching was performed using an Amtec Kistler laboratory car wash system according to development of a standard laboratory test method for evaluating resistance of automotive top coats to car wash systems.

For comparison purposes, Appellants also prepared the resin according to Blum Example 5. Using this resin, a powder coating was prepared and applied according to the method used for Examples 1-11. Acid and Scratch Resistance were determined as described above. Acceptable Acid Resistance Number is greater than or equal to 10. Acceptable Scratch Resistance Number is greater than or equal

Example No.	Acid Resistance Number	Scratch Resistance Number (residual gloss, %)	Percent Improvement in Acid Resistance Number over Reference	ACCEPTABILITY
1	12	72	33%	YES
2	13	68	44%	YES
3	11	71	22%	YES
4	12	69	33%	YES
5	23	64	156%	YES
6	21	70	133%	YES
7 (comparison)	10	75		
8 (comparison)	22	60		
11	13	82	44%	YES
Blum Example 5	<b>9</b>	75		<b>NO</b>

to 60. A sample was judged as acceptable or not, based on both the acid resistance and scratch resistance.

Only Examples 1-6 and 11 of the present invention gave acceptable numbers for both Acid Resistance and Scratch Resistance. On the other hand, comparative Blum Example 5 showed poor Acid Resistance (values of  $\leq 10$ ) Number of "9". The samples prepared with the compositions of present invention improved acid resistance by about 22% to about 156% over the Blum reference. Thus, compositions of the present invention give superior results compared to the Blum reference compositions.

In response to the January 17, 2007 Office Action, Appellants also narrowed Claim 1 alkyl (meth)acrylates from hydroxy-C<sub>2</sub>-C<sub>4</sub>-alkyl (meth)acrylates to simply two—hydroxyethylacrylate and hydroxypropylacrylate. Inventor Dr. Flosbach also provided a second 132 Declaration in response to the May 31, 2006 Office Action. This Declaration is also attached in the Evidence Appendix. In this second 132 Declaration, Appellants performed Acid Resistance and Scratch Resistance Tests for Examples 1, 5, 6, and 11. For 1, 5, and 6, the hydroxy-C<sub>2</sub>-C<sub>4</sub>-alkyl (meth)acrylates component of the composition was switched from hydroxyethylacrylate to hydroxypropylacrylate. Similarly, for Example 11, the component was switched from hydroxypropylacrylate to hydroxyethylacrylate. In other words, Acid and Scratch Resistance Numbers for compositions comprising both components, hydroxyethylacrylate and hydroxypropylacrylate, were made available for Examples 1, 5, 6, and 11.

The data are summarized in the Table II below:

Example No.	Acid Resistance No.	Scratch Resistance No. (residual gloss, %)	Percent Improvement in Acid Resistance Number over Reference	ACCEPTABILITY
1 (HPA)	13	70	44%	YES
5 (HPA)	22	68	144%	YES
6 (HPA)	22	70	144%	YES
11 (HEA)	14	70	55%	YES
Blum Example 5	<b>9</b>	75		NO

Clearly, the Acid Resistance Numbers improved from about 44% to about 144% over the Blum reference example even when the hydroxyethylacrylate and hydroxypropylacrylate compositions were switched. For the hydroxy-C<sub>2</sub>-C<sub>4</sub>-alkyl (meth)acrylates component in Claim 1, Appellants claim only two compounds—hydroxyethylacrylate and hydroxypropylacrylate. And for both of these acrylates, Appellants have shown unexpected and superior, that is an improvement in acid

resistance while maintaining acceptable scratch resistance property of the coated samples.

In relation to the ranges in Claim 1, the Examiner noted that “a limited showing of criticality is insufficient to support a broadly claimed range.” Appellants do not disagree with the Examiner’s point, except that it does not apply to the present situation. Particularly, criticality of a range is only at issue where the range is needed to establish the nonobviousness of the invention. See MPEP § 2144.05(III). Here, Appellants have made no assertion, and require no assertion, that the ranges in Claim 1 are critical to the nonobviousness of the claim. The ranges are not critical to the *patentability* of the Claim 1 invention but rather are important to the *operability* of the invention. For example, Appellants’ Specification confirms the purpose of the Claim 1 ranges, at Page 2, Line 31–Page 3, Line 9. Appellants reproduce the paragraph below:

In the process according to the invention, 1,6-hexane diisocyanate, diol component and hydroxyalkyl (meth)acrylate are reacted stoichiometrically with one another in the molar ratio  $x$  mol 1,6-hexane diisocyanate:  $(x-1)$  mol diol:2 mol hydroxyalkyl (meth)acrylate, wherein  $x$  means any desired value from 2 to 5, preferably from 2 to 4. At values of  $x > 5$ , it is often necessary to use synthesis temperatures which are so high that there is a risk of free-radical polymerization during the synthesis and/or products are obtained which, with regard to use as powder coating binders, have excessively high melting points or ranges, for example, above 120°C. Moreover, it is, in general, not possible to achieve adequate crosslink density with powder coatings formulated with polyurethane di(meth)acrylates as binders that have been produced at  $x > 5$ .

Appellants list the potential operability problems when  $X$  is greater than 5:

- (i) risk of free-radical polymerization because of the need for higher synthesis temperatures;
- (ii) high melting points of the powder coating binders from  $X > 5$  synthesis products; and
- (iii) lack of adequate cross-link density in powder coatings formulated with the polyurethane di(meth)acrylates with  $X > 5$ .

As discussed *supra*, Appellants previously submitted two 132 Declarations from inventor Dr. Carmen Flosbach under 37 C.F.R. § 1.132. According to the Examiner, the declarations are deficient because the examples of the declaration are not

commensurate in scope with the claims. Further, according to the Examiner, the claims in the present application "encompass fractional values of X and molar ratios of the diols that are not exemplified within the declaration." The Examiner further suggests that a relevant showing would be where X is equal to 2.5, that is when the hexane diisocyanate mole percent is 41.6%, because that is what the prior art exemplifies.

In the first 132 Declaration, Appellants prepared the resin in Example 5 of the Blum reference and compared it with those of the present invention by measuring its Acid and Scratch Resistance. As suggested above, the resins of the present invention showed unexpected results in terms of the scratch and acid resistance over the Blum resins. The resins described in the 132 Declaration were prepared with:

X value at 2	Example 1;
X value at 3	Examples 2-3, 5-8, & 11;
X value at 4	Example 4.

Thus, Appellants demonstrated at least the workability and the possibility of achieving superior results at:

X value at 2	that is hexane diisocyanate (HDI) mole percent at <u>40%</u> ;
X value at 3	that is HDI mole percent at <u>42.8%</u> ;
X value at 4	that is HDI mole percent at <u>44.4%</u> .

Appellants respectfully submit that, because data for HDI mole percent at 40%, 42.8% and 44.4% were submitted in the 132 Declarations, the process in which the value of X is 2.5, that is HDI mole percent of 41.6%, is commensurate with the scope of the claim.

Because Claims 4, 7, and 10 are dependent claims, which recite even further limitations to the claim that has already been traversed, Appellants rely upon the arguments presented above in rebuttal to the Examiner's assertion that Claims 4, 7, and 10 are obvious over Blum.

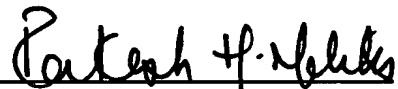
**VIII. CONCLUSION**

For the reasons set forth above, the Board of Patent Appeals and Interferences is respectfully requested to reverse the final rejection of pending Claims 1, 4, 7, and 10, and indicate allowability of all claims.

Please charge any fee due which is not accounted for to Deposit Account No. 501447 (Potter Anderson & Corroon, LLP).

Respectfully Submitted,

BY:



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Date: February 19, 2008

### CLAIMS APPENDIX

1. A process for the production of polyurethane di(meth)acrylates in which 1,6-hexane diisocyanate is reacted, without solvent and without subsequent purification operations, with a diol component and hydroxyethylacrylate or hydroxypropylacrylate, in the molar ratio  $x : (x-1) : 2$ , wherein  $x$  means any desired value from 2 to 5 and  
wherein the diol component is selected from the group consisting of combinations of
  - 20 to 80 mol% hydrogenated bisphenol A with 80 to 20 mol% 1,10-decanediol,
  - 20 to 80 mol% hydrogenated bisphenol A with 80 to 20 mol% 1,6-hexanediol,
  - 60 to 90 mol% neopentyl glycol with 40 to 10 mol% 1,6-hexanediol,  
andthree-component combinations comprising in each case 10 to 50 mol% 1,3-propanediol, 10 to 50 mol% 1,5-pentanediol and 10 to 50 mol% 1,6-hexanediol, wherein the mol percentages add up to 100 mol% in each of the combinations.
4. Polyurethane di(meth)acrylates produced using the process of claim 1.
7. Powder coating compositions containing the polyurethane di(meth)acrylates produced according to the process of claim 1 as binder.
10. A substrate coated with a layer of the powder coating composition according to claim 7.

**EVIDENCE APPENDIX**

1. First Affidavit by Dr. Carmen Flosbach under 37 C.F.R. § 1.132 previously submitted with Response to the Office Action of December 19, 2005.
2. Second Affidavit by Dr. Carmen Flosbach under 37 C.F.R. § 1.132 previously submitted with Response to the Office Action of May 31, 2006.

APPLICATION No.: 10/782,098  
ATTORNEY DOCKET No.: FA 1224 US NA

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**RELATED PROCEEDINGS APPENDIX**

None